Ministry of Natural Resources
Ontario

Northwestern Ontario Forest Technology Development Unit

Northwestern Ontario Boreal Forest Management

Technical Notes

TN-06

1990

91-05072/

PRE-COMMERCIAL THINNING AND MECHANICAL CLEANING MULTIPLE BENEFITS FROM STAND IMPROVEMENT

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INTRODUCTION

Pre-commercial thinning and mechanical cleaning has been used on selected sites within the Dryden Crown Management Unit (DCMU) since 1986. The primary objectives of the pre-commercial thinning were (1) to reduce the density of overstocked, naturally regenerated or aerially seeded jack pine (*Pinus banksiana*), and (2) to produce uniformly spaced spruce-aspen stands where survival of the originally planted conifer trees resulted in an understocked conifer plantation. Mechanical cleaning was used to release suppressed stands of planted white spruce (*Picea glauca*) from overtopping, intolerant hardwood species.

The purpose of this technical note is to describe the methods and potential benefits of these techniques on the DCMU. It is also intended to increase the level of awareness among local forest managers of pre-commercial thinning as a tool for meeting both silvicultural and wildlife objectives. Operational advantages and disadvantages are discussed thoroughly elsewhere (Murray and Cameron 1987).

Pre-commercial thinning can be performed effectively with brush saws by a local labour force.

Naturally or artificially seeded jack pine plantations were thinned at about 10 years of age to an approximate spacing of 2 x 2 m. This nominal spacing effectively reduced stand density from 8,000-10,000 stems per hectare to 2,500-3,000 stems per hectare. Losses due to insects, disease and other natural causes are expected to reduce the plantation density at 20 - 35 years of age to approximately 2,000 stems per hectare. An analysis of jack pine pre-commercial thinning is available elsewhere (Vassov and Baker 1988).

Most of the regenerating spruce plantations were on small (25-30 ha) clearcuts well spaced among a patchwork of older, harvestable stands. When planted spruce became severely overtopped by trembling aspen (*Populus tremuloides*) or white birch (*Betula papyrifera*), motor-mechanical thinning/cleaning was used to release the crop trees whether they were natural or planted. When the conifer trees were present at 2 x 2 m spacing, stands were mechanically cleaned by removing all overtopping hardwoods. Aspen was thinned to 3 x 3 m spacing where spruce crop trees were not present, thus creating an aspen-

spruce stand with spacing varying from 2 x 2 m to 3 x 3 m depending upon the relative proportion of hardwood and conifer trees. Woody shrubs were cut if crowns were within 1.2 m of the top of the crop trees. Trees were cut with brush saws or Sandvik brushing tools. Crop trees were selected for good form; straight stem; single leader; sound bole; absence of injury, cankers or rust; and dominance.

Thinning occurred from the middle of August through to the end of December due to funding and work force availability. The absence of deep snow and favourable working environment also makes this time period desirable for manual thinning.

The net benefits of pre-commercial thinning operations were evaluated from an economic, silvicultural and ecological perspective.

ECONOMIC BENEFITS

Jack pine pre-commercial thinning has been considered uneconomical by some (Rudolph 1984) depending upon the wood supply analysis; however, the benefits to the community in the form of employment were seldom considered. Original estimates for pre-commercial thinning of jack pine in Dryden exceeded $600 per ha. To date, a total of 5,000 ha of jack pine and mixed stands have been thinned/cleaned by local contractors for an average of less than $300 per ha (1986 - 1988 figures). The Ministry of Natural Resources received a cost-effective silvicultural treatment and the local economy benefited from the employment opportunities created.

These benefits manifest themselves in reduced welfare and unemployment insurance payments in the community while the availability of jobs increases the self-esteem of workers. However, motor mechanical thinning can be dangerous and the potential costs to the community of personal injury and Workmans Compensation claims also have to be considered. Comprehensive training and proper use of safety equipment will keep personal injury to a minimum.

Contractors learned the thinning procedure readily and were able to effectively use the selection criteria laid out. The work was labour-intensive but had low overhead, which meant that start-up costs were minimal and the number of potential contractors kept the bidding competitive.

SILVICULTURAL BENEFITS

Silviculturally, thinning/cleaning was intended to elicit a desirable crop tree response. The desired outcome was a greater supply of short rotation wood resulting from a fully stocked stand of well-spaced trees, relatively free of competition.

The economic value of pre-commercial thinning of seeded jack pine plantations results from increased merchantable volume (Vassov and Baker 1988). Estimates of volume increments can be extrapolated from the variable density yield tables for planted jack pine (Bell et al. 1989).

The jack pine stands thinned in 1986 and 1987 for $210 - $300 per ha were established in the late 1970's for approximately $75 per ha for scarification and $30-60 per ha for seeding (1977-1980 figures). This brings costs into

Thinning is intended to elicit a desirable crop tree response.

line with those of stands planted in the same time period which had associated costs of approximately $75 for scarification, $500-$600 for planting, as well as additional costs for tending, when required.

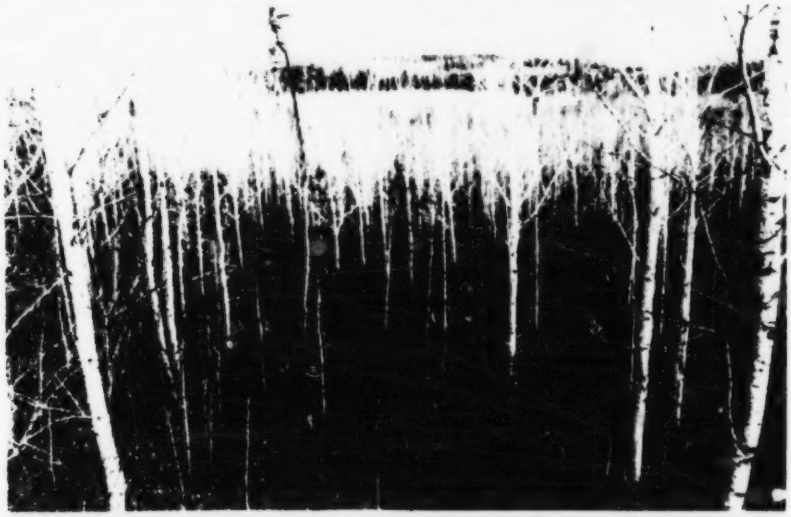
Planted stands of white or black spruce (*Picea mariana*) may be over- or understocked with crop trees, or overtopped by competing vegetation. Thinning will both release and space the conifer crop trees but may also select and space aspen trees to produce higher value hardwood and softwood products.

Manual cleaning of planted stands can be an alternative to chemical release where aerial spraying is undesirable such as areas used extensively for outdoor recreation or near human habitation. It can produce a valuable well-spaced mixedwood when the planted crop trees are not of sufficient density. In this latter example, a combined thinning and cleaning operation becomes a cost-effective option to re-treatment.

WILDLIFE BENEFITS

The enhancement of habitat for some wildlife species is one of the benefits resulting from pre-commercial thinning and mechanical cleaning. Lower productivity of browse producing shrubs on sites typically selected for jack pine seeding, and the high density of juvenile, naturally or artificially seeded jack pine stands may virtually eliminate browse production in these stands. Thinning opens up these stands to increase opportunities for movement of moose (*Alces alces*), deer (*Odocoileus virginianus*) and it increases light penetration for the production of cherry (*Prunus spp*), birch, green alder (*Alnus crispa*), upland willow (*Salix humilus*) and trembling aspen; the most common ungulate food species on these sites. Thus, browse is stimulated where it was previously in limited supply.

On the more productive, fine-textured soils common on the DCMU, thinning of aspen, white or black spruce would normally occur when the major browse producing species would be growing out of reach of moose and deer. Cutting these species back regenerates abundant browse from aspen, birch, mountain maple (*Acer spicatum*), mountain ash (*Sorbus decora*), red osier dogwood (*Cornus stolonifera*), willow (*Salix sp*), green alder, and beaked hazel (*Corylus cornuta*). Most of the thinned and cleaned areas in the DCMU exhibited abundant moose and deer browsing activity after thinning.



Hardwood and softwood products can be developed in a well-spaced mixedwood.

Where conifers were greater than 2.5 m in height the stand also provided horizontal shelter from wind and substantial security cover from hunting pressure and predators. Stand attributes are also compatible with the requirements for moose early winter habitat when some conifer cover and abundant browse are both available in close proximity. The value of these thinned stands is enhanced by their close proximity to uncut blocks of older trees resulting from the harvest patterns used on the DCMU. This mosaic of young and older stands contributed to the net wildlife benefits.

Severed stems indicate pre-thinning density of jack pine.

In addition to the obvious benefits to deer and moose, there also appeared to be an increase in the availability of food for black bear (*Ursus americanus*) through the increased production of raspberry (*Rubus* spp) and cherry and the maintenance of blueberry (*Vaccinium* spp.) patches. Food supply for ruffed grouse (*Bonasa umbellus*) was likely maintained in areas where poplar was thinned to 3 x 3 m, and snowshoe hare (*Lepus americanus*) habitat was maintained by providing food species and conifer cover in close proximity to each other.

Increased hunting opportunities resulting from the potential increases in moose, deer, bear and grouse populations must also be considered a benefit of pre-commercial thinning and mechanical cleaning on crown lands, particularly when they are close to an urban centre such as Dryden.

Finally, in these times of heightened environmental awareness and increased wood utilization, manual removal of hardwoods to produce a well-spaced mixedwood can be a desirable alternative to chemical tending with 2,4-D or glyphosate. This is especially true on very small cutovers or cut blocks near private land such as on the Dryden Crown Management Unit where aerial use of herbicides is restricted. This option is particularly attractive when concerns over the use of chemical herbicides is expressed by the public. This option is not as attractive on large cut blocks or as distance from a large work force is increased.

Browse species developing in thinned jack pine stands.

CONCLUSIONS

Thinning should not be viewed strictly as a silvicultural tool, but as a method to improve the overall value of the forest in a social, silvicultural and ecological context. Local employment and hunting opportunities go hand in hand with an increased potential for short rotation merchantable wood and a reduction in the use of herbicides.

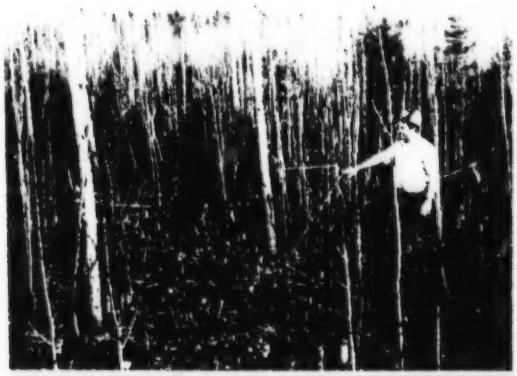
Pre-commercial thinning and mechanical cleaning is recommended for specific situations in northwestern Ontario where significant benefits can be realized:

1. In dense juvenile jack pine stands, it can be used effectively to increase merchantable yield and reduce rotation, while at the same time increase the quantity and quality of wildlife food on sites where browse is not normally abundant.

2. Where jack pine stands of a specific density are desired on sites which can be aerially or precision seeded, seeding followed by thinning can be a realistic and cost-effective alternative to planting.

3. Manual removal of hardwoods from a poorly stocked conifer plantation on productive sites close to the mill or near private lands can reduce the level of competition to the crop trees, restore wildlife browse species into desirable height classes and reduce the use of herbicides in areas subject to more intensive outdoor recreation.

4. Manual thinning/cleaning of poorly stocked conifer plantations can encourage both conifer and hardwood crop trees thereby creating a quality mixedwood. This is particularly valuable when there is sufficient demand for hardwood products and where the alternative would be re-treatment of the site.



Without thinning, this chest-high browse would be less abundant and the site would be dominated by larger aspen trees.

Large aspen removed to release conifer crop trees resulting in increased wildlife browse production.

Conifer crop trees can be selectively released by manual thinning as an alternative to herbicides when broadcast application is not desirable.

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ISSN 0846-6106

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